Fig. 1

Fig. 2

Fig. 3.

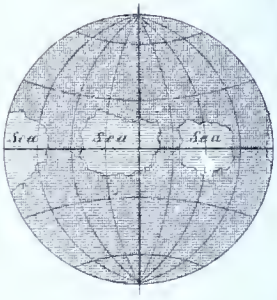


Fig. 4

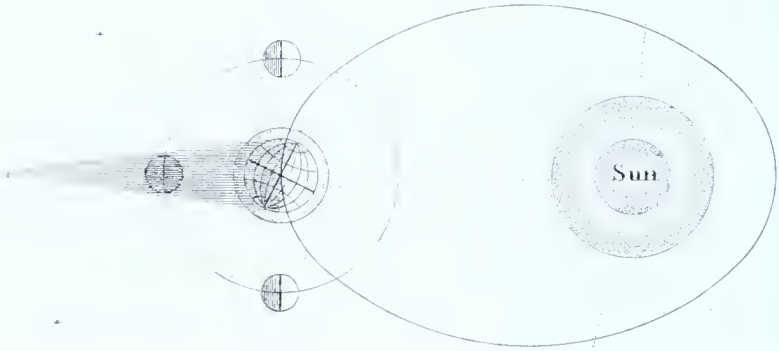
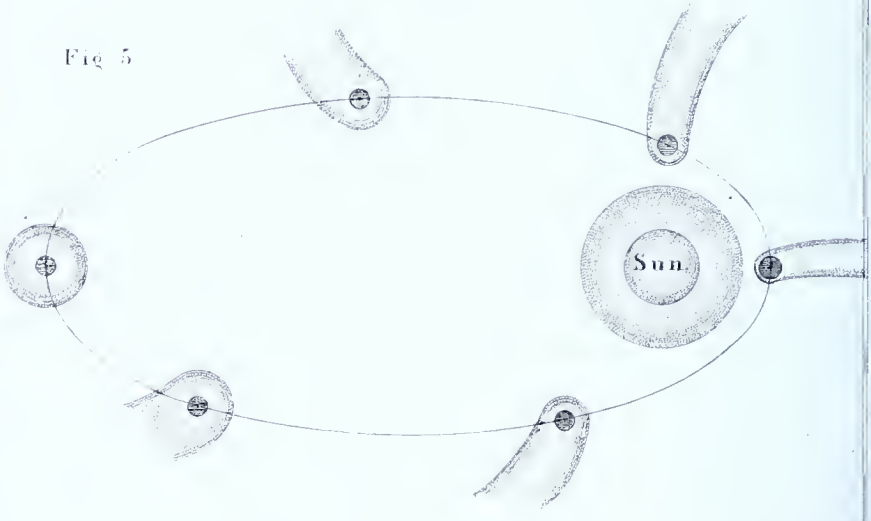


Fig. 5



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A

PRELIMINARY TREATISE

ON THE

LAW OF REPULSION,

AS A

UNIVERSAL LAW OF NATURE:

IN WHICH THE

MOSAIC HISTORY OF CREATION

IS VINDICATED AND SUSTAINED,

AND VARIOUS NATURAL PHENOMENA (HERETOFORE MYSTERIOUS)
CLEARLY EXPLAINED.

PHILADELPHIA:
LINDSAY AND BLAKISTON.
1853.

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PHILADELPHIA:
T. K. AND P. G. COLLINS, PRINTERS.

CORRESPONDENCE.

PHILADELPHIA, November 19, 1852.

TO ****** *. **********, ESQ.

MY DEAR SIR: You will recollect the various conversations we have had on the subject which has occupied your attention for so many years, and that, when I returned the notes and diagrams in reference thereto, which you were kind enough to place in my hands, I urged upon you the injustice you were doing yourself and the world by not making your discoveries public. Your replies were, at the time, satisfactory, and, knowing that your business relations conscientiously occupied the whole of your time, I did not press the matter. But now, as the whole learned world seems agitated in reference to the subject matter of your discoveries, and the greatest minds are occupied in endeavoring to arrive at the truth in respect to scientific matters hitherto in doubt or darkness, but made plain by your system, it seems necessary, if you would hereafter claim priority of discovery, that you should give to the world, without delay, the results of your protracted investigations. Hoping that this earnest suggestion will be followed by your prompt action, I remain

Yours, very truly,

****** *. *******.

PHILADELPHIA, November 20, 1852.

TO ****** *. *******, ESQ.

DEAR SIR: Your kind note of yesterday was received. It affords me pleasure in realizing the interest taken by you in the investigation of that grand subject which has so long occupied my attention. The study of the works of the Great Creator, in every par-

tieular, is, without doubt, worthy of the immortal mind of man; but in no department of the universe ean there be found a subject more overpowering and absorbing than the laws governing and regulating the harmony and perfeetion of the eelestial bodies. I have intensely enjoyed it, and have, on various oeeasions, determined to give the results of my investigations to the world. But, in the divine fitness of things, circumstanees beyond my eontrol have thus far prevented it, and you are suffieiently aequainted with me to know that, at present, the important and neeessary duties devolving upon me, in other respects, render it almost, if not quite, impossible for me to undertake a work which we mutually think would be profitable to every eandid mind, and partieularly so to every one who truly prizes the preeious volume of Inspiration.

But, feeling that the time has eome when the world should have the results of my investigations on this subjeet, and taking advantage of your urgent solieitation, and knowing your entire fitness for the accomplishment of that object, I have deeided to entreat you, as you have a perfeet understanding of the whole subjeet, to arrange and digest my various notes, whieh are not, at present, in a condition for publication. If you conclude to eomply with my request, I will give you every assistanee in my power, to bring out, either in a eompendious form or in full, the whole subjeet.

Hoping a favorable reply, I remain

Yours, very respectfully and truly,

****** *. **********.

AUTHOR'S PREFACE.

THE foregoing correspondence shows the origin of the present treatise, and the position the writer sustains in its production. For its arrangement and literary character he is alone responsible; while the facts and discoveries set forth are mainly those of the original founder of this new system of natural philosophy. Of his claim to priority of discovery, there is the strongest and most satisfactory proof that the whole system was digested and arranged in his own mind, and written upon, a number of years previous to the publication of anything having a bearing on the subject. The writer has had free access to his notes, and the aid of his personal explanations, and has endeavored to present, in a condensed form, the general outlines of his new system. In aiming to place the subject in the simplest and plainest manner, before the minds of the public generally, the usual scientific expressions and tech-

nicalities have been as much as possible avoided. The writer has endeavored to be modest and yet dignified, as the nature of the subject demands.

It is proper and just to the discoverer (as well as a pleasing duty on the part of the writer) to state that he possesses an unusually active and original mind—one well fitted by protracted self-culture for the patient research and minute investigation required during the series of years he has devoted to the subject. He has laid his foundation deep, and built his superstructure step by step, and by slow degrees, till there is not a beam in it that does not rest on the strongest supporters. We have no fears of its permanent stability.

It has been a question with us, whether or not to delay publication until an extended volume could be prepared, but we have finally decided to place the general features of the system in their present shape before the public, leaving it for them to decide whether they will demand a more elaborate work, or prefer further developments in the perhaps more pleasing form of popular oral and experimental lectures. Either expression of public opinion will be immediately responded to.

We request and urge free criticism and interchange of opinion, and would here announce that we shall be happy to receive from any and every reader a full and candid opinion of the merits of our system, with his approval or objections. If this is generally responded to, we shall be enabled, in a subsequent volume, to reply to them at length. In this way our correctness may be tested, and the cause of science advanced. Such communications may be addressed — "Repulsion, care of Messrs. Lindsay and Blakiston, Philadelphia, Pa."

PHILADELPHIA, *December*, 1852.

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PRELIMINARY TREATISE, ETC.

REPULSION may be concisely defined as the exact opposite of Attraction. It is that property which tends to drive one body from another, while attraction seeks to force them together. It is a universal property, affecting all material substances, and operating alike in the microscopic world and in the splendid movements of the solar system. It aids in keeping the planets in their orbits, and in sustaining the form of the imperceptible dust on the butterfly's wing. Wherever attraction, of whatever kind, is at work, its effects are counteracted by its antagonist repulsion. Either force, acting alone, would inevitably produce the most disastrous results. Attraction would of itself crush the human body into its original dust, while repulsion would drive it into indefinite space; but the two, acting separately and distinctly, and yet in perfect harmony, preserve and maintain the unity and the very existence of all material things.

As *gravity* is a universal property of matter, and

is familiarly said to reside in the earth and in all solid substances, so the principle of repulsion has its home in the *atmosphere*, from whence it sends forth its influences, not only to the body it directly envelops, but to other bodies composing the same system. What is true of our earth and its atmosphere, is doubtless true of all other planets with which it is connected. The sun attracts the earth and is attracted by it, while the earth also repels the sun and is in turn repelled by it, and in both cases through the medium of their respective atmospheres. As the sun, by reason of its immense size, is the *centre of attraction* in the solar system, so it is also the *centre of repulsion*, by reason of its immense atmosphere. The same law which governs grosser matter, rendering *attraction* greater in proportion to its amount, also renders *repulsion* greater in proportion to the amount of atmosphere.

The law of gravitation, when discovered by Newton, was at first a mere *assumption*, and was to be proved by subsequent observation and experiment. The application of the law, under all circumstances and to all natural phenomena, is the demonstration of its truth. So with the law of *repulsion*. Some force antagonistic to that of gravitation has always been required in scientific investigation, and a certain intangible, ideal power, called *centrifugal* or *projectile force*, has been pressed into service by

philosophers, of the nature and cause of which, as also of attraction, they are *confessedly* entirely ignorant. There was a necessity for some power to counterbalance that of gravitation, and hence was created this centrifugal force, possessing no other attribute than that of propelling bodies once set in motion in a straight line through space. But centrifugal force does not meet all the demands of science, and various natural phenomena require still something more for their explanation. Philosophers and *savans* have for years sought, and are still searching, for the grand desideratum. We claim to have found it in the law of *repulsion*.

That there is a repulsive force exhibited in some substances, under certain circumstances, is well known. *Electrical repulsion* is a settled scientific expression. Microscopic research indicates that "attraction *and repulsion* seem to be the principal active powers whereby the natural changes in bodies are produced."* The repulsive properties of heat are also well established.

If, then, we *assume* the existence of the *universal law of repulsion*, and show its exact and unfailing application wherever its opposite attraction exists,

* See a treatise entitled "Of Microscopes and the Discoveries made thereby, by Henry Baker, F. R. S. &c." London, printed for J. Dodsley, 1785, New edition, vol. ii. pp. 26–32.

and, especially, if by it we are able to explain and illustrate those phenomena which have heretofore baffled the researches of the scientific world—if our theory sustains itself in every possible emergency, and is sustained by the only authentic record we have respecting the formation of our system, will not its truth be demonstrated as clearly as that of attraction ?

An examination of the Mosaic account of the creation of the earth and the system with which it is connected, will not only throw light on that grand subject, but will best enable us to present our views in detail, as the circumstances of the investigation require.

With the *origin of matter* we have nothing to do. We shall probably, in this state of existence, never know anything with certainty on the subject, nor is it necessary to our moral well being or to the purposes of science that we ever should. Neither do we know, nor is it necessary that we should, how the universe first started into being; it is enough for us that it is in existence. We may speculate and theorize on the subject, but to no good end. Our business is with things as we find them, though we may cherish such speculations as best coincide with our own theories.

In pursuing our present investigations, we commence with *chaos*, as described in the first chapter

of Genesis. It may not be amiss, however, to state our own views, based upon our system, as to the previous condition of the universe.

The probability is, that our system is but one of an indefinite number of systems revolving around a common centre, and all subject to the same laws. The sun being the common centre of our system, it is probable that the earth and the other planets were originally thrown off or ejected from that body, and took their positions in space, under the same laws that governed the whole universe. Whether all the planets composing our system were thus *created* (to use the common term) at once or not, is a matter of not the slightest consequence, though our belief is that our whole solar system is included in the expression "the heavens and the earth," in the 1st verse of the Mosaic record, as the Hebrew word "shamayin" is plural, and means more than the atmosphere. We cannot even admit the possibility that the earth may have remained in the state in which it was ejected from the sun, for myriads of years before the Almighty commenced its preparation as an abode for the race of intelligences about to be created—a preparation that might be familiarly likened to the arrangement and fitting up of a house for expected tenants, and which is meant by the common term *creation*, as used in the inspired record. Our belief is that the Author of the universe

never made anything to lie idle, and that the ejection of the matter composing the earth from the sun, and the work of creation as described, were simultaneous, or nearly so, as we shall hereafter explain. We extend our belief still further, and hold that all other worlds and systems of worlds had a similar origin from *the common centre of the universe*, and assumed their present forms and motions in obedience to the universal and eternal laws on which our present system is based.

Of *chaos*, we can form but a very indefinite idea. By it is meant the condition in which the matter composing the earth was when ejected from the sun, and during the brief space before the Almighty commenced the work of preparation alluded to. It was a confused, shapeless mass—not globular as it now is, for that was the effect of the laws of which we are about to treat. Probably we can find no more expressive language than that of the inspired narrator, viz., "the earth was *without form and void*," or, as the Hebrew text "tohu vabohu" is more properly translated, "*invisible* and *unfurnished*;" those terms meaning precisely what they do now—the former indicating the absence of light, and the latter sustaining our illustration of an unfurnished house as used above.

We here find ourselves in direct opposition to the immortal Newton and subsequent philosophers,

who believe that "in the beginning" our globe was of the same solid, spheroidal figure we now find it to be, and who offer no explanation as to how it received that form other than to refer it to the direct fiat of the Creator—asserting plainly that it is "unphilosophical to seek for any other origin, either for its substance or *shape*, or to pretend that it could have risen out of a chaos by the *mere laws of nature*." Our objection is that, as all the worlds of which we know possess the same shape, there must have been a direct and separate expression of the Divine power, a separate and distinct command for each and every world at the time when it was created. This, besides being unnecessary, is, from what we know of the Divine economy, unreasonable and absurd. If effects required by such an infinity of worlds cannot be produced by some *universal* law or laws, the attribute of Omnipotence is rendered a nullity. How beautifully and distinctly our theory elucidates this subject, and shows how, not only our little planet, but all those of our system and of other systems, and how our system and all other systems, and finally the whole universe itself, not only received their shape, but continue to move harmoniously in their endless circles in obedience to those "ordinances of Heaven" decreed by Him who has also "set the dominion thereof in the earth," will be clearly seen as we proceed.

Of the nature or consistency of the chaotic mass, we, of course, have no certain knowledge. It must, however, have been soft and easily moulded, but not necessarily liquid, in order to yield readily to the two forces so soon to operate upon it.

"And God said, Let there be light: and there was light." No argument can be necessary to establish the fact that *this light* has no reference to the *lights* created or established on the fourth day of creation. (Gen. i. 14—18.) Such a useless and absurd repetition would be but the work of a bungler, which the inspired writer certainly is not. The words employed in the third verse express only the *matter of light*, while those used in the fourteenth verse signify simply an *instrument* or medium by which light is dispensed. The original word *aor* implies not only light, but fire and heat.

It is not probable, nay, it is hardly possible, that so important an adjunct as the atmosphere should be omitted, either intentionally or carelessly, in the record of creation, and yet it is so, unless we regard it as meant by the words "Let there be light," &c., for we shall show that the word "firmament," subsequently used, conveys an entirely different idea. We know that the atmosphere contains the principle of flame, and is the chief supporter of combustion, and we assume that the command in question expresses its creation. Without the atmosphere, life

could not be sustained, and without its pressure (or whatever term we choose to give its properties) the whole earth would crumble and fly off in minute atoms. Without the atmosphere, even admitting the sun to be a luminous body, we could never be sensible of its rays, unless our eyes were immediately directed towards it, for it is the medium through which those rays are transmitted. Herschel says that, *agreeably to the laws of gravity*, the *matter of light* (*i. e.* the *atmosphere*), of all material substances the most subtle and attenuate, *must have been evolved first of all*, for by these alone the sun operates, and has ever operated, upon the earth and other planets.*

How perfectly then does our definition sustain the harmony of the inspired record, and silence the cavil based on the fancied discrepancy or repetition in the third and fourteenth verses! The earth was ejected from the sun into space. The light of the sun was not at once needed in the economy of creation, but the atmosphere was, both as a protection or shield for the infant earth, and as a medium for the operation of the sun when its direct influence should be required.

It is perfectly reasonable to suppose that the first four verses of Genesis narrate what occurred in an instant of time. The ejection of the earth from the sun, and the surrounding it with the atmosphere,

* Phil. Trans. vol. 85.

may have been the results of simultaneous commands, and we believe such to have been the case, and that the expression "God divided the light from the darkness," means simply that the atmosphere, which was attached to the masses of matter when ejected from the sun, was then collected and concentrated around the various planets, even as it is to this day, thus clothing them "with light as with a garment."* All this, we say, may have been the work of an instant, and we believe it was.

The light, or atmosphere, being thus concentrated around the earth, left the space beyond empty, and, of course, dark, and thus, for present purposes, the former was called Day and the latter Night. The meaning of these two terms must, of course, be carefully distinguished from that we now attach to them, for it is certain that, until the sun was ordained to act directly as our great luminary, there could have been no such alternation of day and night, of light and darkness, as we now experience. Indeed,

* Psalm civ. 2. "Who coverest *thyself* with light as *with* a garment." Professor Bush says, "Our translators, without due attention to the scope, have inserted *thyself* in this passage of a Psalm, in which it will be evident, on inspection, that the writer's aim is to recite the successive gradations in the work of creation, and thence to educe matter of lofty praise to the great Architect."

It is evident, therefore, that the words "the earth" or "the planets" should occupy the place, in our translation, of the word "thyself."

there was not, during the first three days of creation, what we now call *light*. There was the sun, the dispenser of light, and the atmosphere, the medium of its transmission, but their union was not complete until the fourth day, when illumination first took place. We must not fail to bear in mind constantly that the sacred writer is speaking, not only of our little planet, but of the majestic system of worlds, each clothed in its atmosphere of day, and floating in the interminable expanse of night.

That the atmosphere is the medium by which the earth is illuminated is universally admitted. "Without air," says Whewell, "we should see nothing except objects on which the sun's rays fell directly or by reflection. It is the atmosphere which converts *sunbeams* into *daylight*, and fills the space in which we live with illumination." Thus, by the union of the "greater light," or, more properly, the great *luminary of heaven*,* with our atmosphere, or "light" called day, we become sensible of the *light of day*, and, by the absence of its direct influence, we realize the *darkness of night*. There can be no *light of day* without atmosphere.

If the expanse beyond the limits of our atmosphere is illuminated by the rays of the sun, why can we not see the large body of the moon except when the sun shines directly upon it? An object is visible to

* See the original.

us until so lessened by distance as to produce no impression on the retina of the eye. Such is not the case with the moon. Again, the moon would be distinctly visible in its first quarter, while now the slight manifestation it presents is caused by the light it borrows from the illuminated portion of the earth's surface.

Again, if our atmosphere were interminable, there would be continued *crepusculum*, or twilight, from the setting to the rising of the sun, the admitted cause thereof being that "the *upper* regions of the atmosphere remain for some time exposed to the sun's rays, and thus illuminate the whole by reflection."

Again, if the whole immensity of space is illuminated by the rays of the sun, what is the cause of the darkness of night, for which the minute shadow of the earth will not account? (See Fig. 4 in the frontispiece.)

The dull light of the moon, when fully eclipsed, may be urged as an objection to this position; and our answer is that, at all times, the atmosphere which is exposed to the action of the sun's rays is illuminated, and, during the eclipse, that portion of it which borders the earth is amply sufficient to produce the phenomenon. Else, why is not the whole disk of the moon *always* visible under favorable circumstances?

This view of the subject is not at all impaired by

the expression "the evening and the morning were the first day," which was evidently used merely to convey the idea of the length or duration of time, and not to express what the words now signify. There may, and must be, such division of time, even where there is no light of day nor darkness of night; as in the polar regions, where six months of day alternate with six months of night, there are stated daily seasons which are *called* evening and morning. That our present meaning must not be attached to those words is absolutely certain, because the action of the sun's rays upon the atmosphere did not commence until the fourth day, and this alone is the cause of the phenomenon as now witnessed.

By "evening and morning," or "the first day," is clearly meant *one complete revolution of the earth on its axis*, and this we believe was accomplished in precisely the length of time now required, viz., twenty-three hours, fifty-six minutes, and four seconds, no more and no less, as time is now computed. We hold ourselves prepared to demonstrate, in this or some future work, the reasonableness and probability, nay, the almost certainty, of this proposition, and that the singular stratification of the earth (that stronghold of certain cavillers) may just as easily have been accomplished in one day as a thousand years. The correctness of our system, however, depends on neither of these presumptions, and, hav-

ing now reached the *gist* of our subject, we leave them for future consideration.

The earth in its chaotic state having been ejected into space, and surrounded with its atmosphere, commenced to move at once, in obedience to the universal laws of attraction and repulsion, both on its own axis and in its orbit around the sun.

We must refer the exact position which the earth and the other planets occupy in the universe, *i. e.*, their relative distance from the sun, &c., not to the direct and special fiats of the Creator, but to those fixed and immutable laws by which the universe is governed. The quantity of matter composing them, and their relative amount of atmosphere, enabled them, under the laws of repulsion and attraction, to assume the exact positions they now occupy, and they could not and cannot move one inch further from their respective orbits. With regard to the revolution of the earth on its own axis, we need not be longer in doubt. This, hitherto, has been referred to the direct and special interposition of the Divine power, rather than regarded as the necessary effect of certain universal laws instituted by the Almighty. Our argument respecting it is the same as that applied on a previous page to the shape of the earth. Our present system explains and elucidates the phenomenon most clearly.

If the earth, as we assert, was originally a portion

of the sun, and was ejected or thrown off from that body while in motion, it must necessarily continue to pursue *individually* the same motion. This rule is absolute, and is illustrated by the simplest examples. If a millstone, or an iron wheel, be fractured suddenly while in motion, the fragment thrown off does not sail smoothly through the space it traverses, but whirls on its axis constantly in the direction in which it was originally revolving. Now, has the sun a revolution on its axis? Unquestionably, yes. In what direction? Certainly from west to east. Has the earth an axial revolution, and in what direction? Just as certainly it has, and from west to east also. It could not be otherwise, without violating what observation proves to be a universal law.

But would the force originally communicated to it be sufficient to preserve that motion for any length of time? Evidently not, for the natural tendency of a revolving body, left to itself, is to cease its revolutions, and so would it have been with the earth, when the force attending its ejection from the sun had expended itself, without the intervention of some other forces to perpetuate the motion. We say *forces*, because no single force could have accomplished the object. Gravitation would have drawn it passively back whence it started, as a stone thrown upwards returns again to the ground.

But, when the chaotic mass reached the bound prescribed for it in the dark fields of infinite space, atmosphere was thrown around it, and instantly commenced the action of those two forces, inherent in the respective materials, which we denominate *attraction* and *repulsion*. These, operating upon the still revolving mass, not yet free from the impetus originally given to it at its ejection from the sun, and being eternal and perpetual in themselves, continued the motion and rendered it also perpetual. The one continually pulling, and the other as steadily repelling the attracting power, the poor earth was effectually foiled in its efforts to gain repose, and literally compelled to pursue its endless gyrations. This is our explanation of the revolution of the earth on its axis. It is plain and simple, and perfectly in harmony with the whole of our system.

This point in time was the commencement of "the first day," as the end of the first complete revolution was its termination.

When these diurnal revolutions commenced, then began also the chaotic mass to assume its spherical shape, than which no consequence could be more certain. The drop of molten lead, shapeless at the top of a tower, becomes a round globule when it reaches the earth; and why? Because the attraction of the earth and the resistance of the atmosphere, acting somewhat like the law of repulsion,

compel those rapid revolutions on its axis that by a universal law educe that form.

What degree of consistency the material of the earth had acquired on the completion of the first revolution, it is impossible and unimportant to know.

But there was still another effect produced on the infant earth by the conjunction of these two forces, viz., that of its passage in a fixed path or orbit around the sun as the natural centre of the system of which it formed a part. What is the cause of this motion? Certainly it cannot be accounted for by the single force of attraction, for that force, unimpeded, would inevitably draw the earth back to the sun, as the stone returns to the spot from whence it was thrown. Neither does the centrifugal or projectile force of philosophers satisfy our minds. We doubt the existence of such a force as described in the books, and made use of in the established theories of the age. We doubt the existence of a force whose disposition is to propel a body in a straight line forever through space, unless there was nothing in the immensity of space that possessed the property of attraction, and we doubt it because there are no corroborating facts or phenomena in actual every-day life to sustain the presumption. For all the other great movements of nature we have corresponding developments in the minuter fields of science. The magnet develops the existence of attraction, and the

commonest experiments with the electrical machine indicate the active principle of repulsion, but for this intangible centrifugal force we can find no parallel. It seems to us that, besides being unnecessary, it is also futile and *unphilosophical* to refer to the special and particular decree of the Almighty what is manifestly the simple result of His eternal and immutable laws.

By our system, the matter is perfectly plain, simple, harmonious, reasonable, and reverential. Instead of detracting from the attributes of Jehovah, it adds to their glory and majesty. It represents Him, not as descending to the necessity of special efforts to produce particular results, as though some portions of the celestial machinery proved defective, but as One whose laws, established from eternity, had never failed or wavered through all the convulsions that have shaken the universe.

The projectile force being superseded by the two forces of attraction and repulsion, it was inevitable that the earth must move onward in some direction. It could not have remained in equilibrium, maintaining only its revolution on its axis. Attraction alone would have returned it to the sun, while repulsion would have driven it off in its original direction through the fields of space. But the two, operating conjointly, pressed it forward in a curvilinear direction, the one preventing its too near approach to the

attracting body, and the other curbing its tendency to recede beyond its influence. We do not need the mysterious centrifugal force of previous systems of natural philosophy to account for this phenomenon. Call the force attending the ejection of the earth from the sun by that name if you choose, but we hold that that force was expended when the ejected mass reached that point in space, distant from the sun, whence, by the laws of attraction and repulsion, it could go no further—laws that fix the precise position of every planet—that say emphatically "Hitherto shalt thou come, but no further"—laws that are as easily demonstrated as any problem in mathematics. Give us the relative quantities of matter composing the sun and Saturn, with their distance from each other, and we will tell you the precise amount of atmosphere of the planet. Give us the amount of matter and atmosphere of Jupiter, and we will tell you its precise distance from the sun. The law is invariable: the position occupied by a planet in reference to the sun depends on the amount of matter it contains, and the amount of atmosphere it possesses. Give us these to an ounce, and we will define its location to an inch.

There has not been, and is not a philosopher living who pretends to understand or account for the so-called centrifugal force, though they cannot sustain their systems without it, and so it is left *confess-*

edly a mystery. We do not regard it so, and believe that our reference of its effects to the law of repulsion is the true solution.

The result of the two opposing forces is the passage or movement of the planet, in its present exactly defined orbit, around the sun as its centre of attraction. The eccentricity of its orbit depends upon the preponderance of its atmosphere, or repulsive power. When in its perihelion, the tremendous repulsion of the sun gives it a certain velocity that is not wholly controlled by gravitation until it reaches its aphelion, when it begins to return in its prescribed line. Of this subject we shall treat more hereafter.

While we are treating of the first day of creation, and referring to the sun as then in existence, it must be borne in mind that we regard it as not then the great luminary, but simply as the grand centre of the solar system. There are those who affirm that *time*, as we now compute it, should date only from the fourth day, *i. e.*, that not until then did the diurnal and annual revolutions of the earth commence. We can see no good reason for this, but, on the contrary, each successive revolution of the earth on its axis seems absolutely necessary to the progressive work of creation, which will be shown as we proceed. The single revolution of the first day doubtless gave the chaotic mass the approximating shape

and degree of consistency requisite for the wonderful and important transactions of the second day.

"And God said, Let there be a firmament in the midst of the waters; and let it divide the waters from the waters. And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament; and it was so."

The original word "rashia" (firmament) has two significations, viz., 1st. *To stretch out, to expand like a curtain;* and 2d. *To make hard and firm by treading, stamping, or beating with a hammer.* The translation given to it by the "Seventy" was στερεωμα, which signifies *that which has been rendered hard, firm, or solid, a foundation or basis.*

We think we have shown conclusively, in our previous remarks, that the *atmosphere* cannot possibly be meant by the word "firmament," as is commonly held. The very necessity of the case forbids it, for the chaotic mass could not have maintained any degree of consistency for the thousandth part of a second, without the protection of the atmosphere, much more have made one complete revolution on its axis. The particles composing it, without the combined effects of attraction and repulsion, must have separated, and there could have been no repulsion without atmosphere. Again, the above construction placed upon the word indicates an en-

tirely different meaning. "Let there be *an atmosphere* in the midst of the waters," is absurd, and the introduction of the word throughout the passage renders it unmeaning and ridiculous.* Again, if the atmosphere is meant, then the clouds containing the "waters above the firmament" should be beyond the limits of the atmosphere, which we know is not the case.

By our system, we understand that by the effects of the two laws of attraction and repulsion, or, in other words, of the two motions by them communicated to the chaotic mass, the earthy particles of matter were gradually separated from the more fluid portions, and collected or concentrated themselves into a sort of band, or wall, thus forming a boundary or partition between the water, one portion of which

* The parallel readings of the passage, Genesis i. 6, 7, 8, will show our meaning:—

And God said, Let there be a firmament in the midst of the waters: and let it divide the waters from the waters.	And God said, Let there be *an atmosphere* in the midst of the waters: and let it divide the waters from the waters.
And God made the firmament, and divided the waters which *were* under the firmament from the waters which *were* above the firmament: and it was so.	And God made the *atmosphere*, and divided the waters which *were* under the *atmosphere* from the waters which *were* above the *atmosphere:* and it was so.
And God called the firmament Heaven, &c.	And God called the *atmosphere* Heaven, &c.

sought the surface, and the other the centre of the revolving mass. Fig. 1, in the frontispiece, will explain our meaning, and will be again referred to. We regard, therefore, the earth itself, that is, the outer crust of it on which we live, as meant by the word "firmament," as *first* used in the sacred narration.

It will be noticed that in the subsequent verses the "firmament of the heaven," and the "*open* firmament of heaven" are spoken of, evidently, in contradistinction to each other as well as to the "firmament" first mentioned, and this without any explanation being given as to their separate creation or establishment. Thus, the earth, being a hard or solid expansion, is a *firmament;* the atmosphere, which "stretches out as a curtain," and in which the "fowl may fly," is called "the *open* firmament," to distinguish it from that which is consolidated and *not* open; while the space beyond, in which all the planets of the solar system revolve, and in which the two great lights and the stars were *set*, is denominated, *par eminence, the firmament of the heaven.* If this distinction is borne in mind, the confusion and mystery ordinarily attending this portion of the divine record will be readily dissipated.

It will also be well to recollect that the whole record of all these stupendous transactions is crowded into the space of a few lines. Moses was not writ-

ing a geological treatise, nor a system of natural philosophy, and, therefore, did not anticipate the objections and cavils that would arise in these "latter days," nor answer them in advance by defining minutely every step in the progress of creation. He merely gives in the concisest manner the general outlines of the great work, and it is for us to fill up the minutiæ from the developments of reason and the discoveries of scientific research. It is fearfully absurd to cavil at a word, or the absence of one, when everything proves the entire harmony and continuity of the record, as it stands. So perfectly does it agree with our system, that we would not alter or transpose a sentence if we could. As we proceed, the beauty and appositeness of this remark will be manifest.

There is one other common idea that we should also divest ourselves of—one which prevails with us all when we read the words "And God said," &c.—one which represents to our minds the Almighty as standing on some particular eminence, and with outstretched arm issuing His special fiats, one by one, in obedience to which the effects of each are produced before our immediate vision. This is also most absurd, though most common. How much easier the consideration, and how infinitely more does it glorify Him, to regard all these effects as the simple but inevitable results of the operation of that

system of eternal, immutable, and universal laws, of which He, and He alone is the Author.

Our view of the effect of the operations of the second day, as illustrated by Fig. 2 in the frontispiece, is confirmed by other passages of Scripture: and here be it fully understood that we claim all proofs drawn from this source as incontrovertible, so deep is our reverence for this venerable volume, and so abiding our faith in every word that it contains. The passages, He "stretched out the earth *above* the waters," and "founded it *upon the seas and established it upon the flood*" (Psalm xxiv. 2), are familiar to every reader.

The probability is that, as the particles of earthy matter composing the "firmament," the wall or partition spoken of, were pressed together under the influence of the two great forces operating upon them, the fluid or watery portions were forced out, both upwards and downwards, leaving an immense quantity inclosed by the hardening mass, and the remainder floating on the surface of the rapidly forming sphere. It is reasonable to suppose that the "waters *above* the firmament" (or earth) were on the second day of a uniform depth, and covered the entire surface of the earth. Indeed, this is rendered almost certain by the account of what occurred on the third day, and which is thus described: "And God said, Let the waters under the heaven be

gathered together unto one place, and let the dry *land* appear: and it was so."

The word *land*, Italicized in the common English version, is an interpolation of the translators for which there appears to be no authority in the narrative itself. The word which is understood, and to which the adjective "dry" refers, is properly the "firmament" of the preceding verse. The true spirit and intention of the verse is evidently that, by the formation of elevations and depressions on the surface of the earth, the various divisions of land and water should be established.

This work had, doubtless, been gradually going on during the second day, as it must have commenced when the influence of gravitation was first exerted. By the law of gravity, all the particles composing a body seek the centre of that body. But that the centre of gravity of the earth is not the exact centre of the earth, is a fact easily demonstrable. Were it the exact centre, the earth must necessarily be a perfect sphere, which we know it is not. We cannot better explain our meaning than by a simple illustration.

Two balls of equal weight, connected by a rod, will have their centre of gravity in the exact middle of the rod, but, if an additional weight be attached to one of the balls, the centre of gravity will be removed to a point in the rod proportionally nearer

to the heavier ball. Thus, if the sun operated upon the earth by attraction alone (supposing such to be possible), its exact centre would be its centre of gravity; but it would, at the same time, seek its common centre and fall to the sun. But, while thus powerfully attracted, it is as constantly repelled, and this repulsion acts as an additional weight upon the earth, causing the centre of gravity to recede from its exact centre. Hence, that portion of the earth the farthest from the sun is actually the heaviest, owing to the pressure of the repulsive force, and without reference to the real density of its matter. This continual recession of the centre of gravity, combined with the fact that the repulsive rays of the sun (in consequence of its revolution on its axis) strike the earth laterally, and not in a direct line (which would only tend to drive it forward), would alone account for the revolution of the earth on its axis. It must be remembered that these repulsive rays act upon the earth like the cogs of a wheel, and, as we have shown that the direction of the revolutions of both the sun and the earth is the same, it follows that the pressure or additional weight thus borne upon the earth must throw its centre of gravity back from its exact centre. And, as this pressure is constant and unvarying, so must the recession of the centre of gravity be un-

ceasing, and the consequent motion of the earth perpetual.

Such a revolution, the earth being entirely covered with water, would naturally cause an accumulation of earthy matter towards the equator, which would thus tend proportionably to accelerate the diurnal motion of the earth at that point, until the power of gravity was neutralized or entirely overcome on the surface (see Fig. 2 in the frontispiece), when a portion of the superabundant matter would pass off, or be ejected into infinite space, where it would, in turn, be consolidated and made to revolve around our earth by the general laws of planetary motion, forming our present moon. It is probable that the preponderance of earthy matter passed off in a continuous stream, or with very short periods of intermission, thus leaving hollows or receptacles for the waters to collect into, and thus form what were called "seas," while the dry land, called "earth," would consequently manifest itself whence the waters were drawn off. It is evident that these cavities would naturally be near the equator, and Fig. 3, in the frontispiece, represents the probable situation of the waters after they were gathered together.

The establishment of the "two great lights"—the sun and moon—is the subject of the record of the fourth day of creation. We are not to understand, from the words "and God made," &c., that these

luminaries were then first *created*, but that, all things being in readiness, the laws by which the earth was henceforth to be governed having begun to act, the various influences of the sun and moon were from this time to be in force. The connection between them and the earth was made manifest, and their operations visible. We have heretofore shown that light and darkness, *called* day and night, existed on the first day of creation, and that the sun and moon are not the sources but the dispensers of light and heat, rendering the distinctions of day and night perceptible.

With the history or material of the sun we have little to do in this treatise. Whether inhabited or not, is a matter of no importance. That the moon is not has been fully settled by recent telescopic researches. The instrument of the Rev. Mr. Craig develops objects that rise no higher than one hundred feet from the surface, which is less than the height of many of our trees or private buildings. Our belief is that, as the earth is an emanation from the sun, so the moon, under the operation of natural laws, was originally ejected from the earth during its first axial revolutions, and took its present position, in obedience to those laws, for the express and only purpose of being and doing exactly what is prescribed in the 14—19 verses of the first chapter of Genesis. The moon is merely a necessary ap-

pendage to the earth, and bears the same relation to it as does a common taper to a single dark room.

The sun, however, being the grand centre of the solar system, is the grand centre of attraction and repulsion. We can only judge of its nature by the effects that manifestly proceed from it. It is undoubtedly governed by the same laws that govern the earth, though what others (unnecessary to the earth) may be in force we know not. As from its body issues the strong principle of attraction, so from its atmosphere issues that more subtle but equally as powerful one of repulsion, under the combined influences of which the earth and all other planets revolve on their axes or circle, in their graceful orbits, as truly and as safely now as on that day when the "morning stars first sang together."

Having now reviewed the Scripture record of creation, so far as is practicable in the present treatise, we proceed to apply the law of repulsion to other phenomena of nature.

COMETS have ever been, in their nature and movements, the most mysterious of the celestial mysteries. They have been regarded as a sort of irrational and irresponsible existences, springing from some unknown source, leading a kind of hap-hazard life, and rushing on to some uncertain destiny. The greatest modern astronomers terminate their disquisitions on the subject by pronouncing it still "mysterious and open to endless speculation." Appearing oftentimes unpredicted, pursuing most erratic courses with a velocity almost inconceivable, presenting various and frequently quaint shapes in their appendages (commonly, but improperly, called tails), they have not only caused astonishment and terror among the ignorant, but have defied astronomical investigation.

We think we are able, in some measure, at least, to evolve the mystery, give them their proper place in the scale of creation, and show that they are governed by the same laws that govern the motions of the other heavenly bodies. They, perhaps, furnish in themselves the strongest evidence of the truth of our present system.

We believe that comets are not mentioned as planetary bodies in any of the sacred writings. But that they are matter, and such matter as is influ-

enced by the sun and the other members of the solar system, is certain, for their orbits around the sun, eccentric and erratic as they are, are truly traced and defined. And, as if purposely to show their susceptibility to the law of gravitation, they are sometimes drawn off from their original orbit by the attractive force of some planet, around which they still revolve, or with which they possibly become amalgamated. A modern writer quaintly remarks that "Jupiter seems, by some strange fatality, to be constantly in their way, and to serve as a perpetual stumbling-block to them." Herschel also remarks that the comet of 1770 "actually *got entangled* among the satellites of Jupiter, and thrown out of its orbit by the attractions of that planet." This comet has not been heard of since, but, if it was finally amalgamated with that planet or its satellites, they have certainly suffered no perceptible derangement, which is a proof of the comparative smallness of the comet's mass, or, more probably, that it has passed off and become attached to some other system. Jupiter being by far the largest planet in the solar system, it is perfectly natural that, next to the sun, it should exert the greatest attractive influence over these aerial wanderers.

The tremendous aphelion distance from the sun of some comets, forbids the idea that they are acted upon by the force of attraction alone; nor will cen-

trifugal force (as commonly understood) answer the purpose of explanation. The very smallness of the comet's body would not allow a sufficient force to act upon it so as to propel it to a distance of 3,371,700,000 miles, as in the case of Halley's comet. Or, for the same reason, the attraction of the planets near which it passes, and which are of infinitely greater magnitude, would inevitably and invariably overcome (as it does in some cases) the force (whatever it may be) that keeps the comet in its onward course. Or the sun itself would, in its perihelion, draw the small morsel of matter to its own surface.

Nothing will account for the movements of these nondescript bodies but the law of repulsion, and it seems a little singular to us that this elucidation of the mystery has not heretofore been revealed and universally received.

Whatever comets are composed of, and wherever they had their origin, they are undoubtedly, in general, *small bodies with a large amount of atmosphere*. As such, they naturally are mainly governed by the laws that govern all atmosphere, of which repulsion is chief. It is this law which keeps the comet in its perihelion from falling to the sun, or to the planets (except in a few cases easily accounted for), as it passes near them. It is this law which is overcome when it reaches its aphelion by the oppos-

ing force of attraction. It is by this law that the tail or train of the comet (*i. e.*, its atmosphere) preserves its position, both in advancing and receding, on the side opposite to the sun—the repulsive force acting upon the atmosphere of the comet like a puff of wind on the flame of a candle. It is this law which prevents the collision of comets with other planetary bodies—a catastrophe to be infinitely dreaded, but which, happily, this law renders almost impossible.

The very great eccentricity of a comet's orbit can only be explained satisfactorily by the law of repulsion. By a reference to Fig. 4, in the frontispiece, it will be seen that the tail, long in its perihelion position, gradually diminishes until, at its aphelion, it is scarcely distinguishable. The solution of the phenomenon is this: the attractive force of the sun overcomes the repulsive force when the comet is at its aphelion, and, consequently, the atmosphere, no longer or but partially operated upon, resumes the natural position of atmosphere, *i. e.*, is concentrated around the body to which it belongs. As the body yields to the influence of gravitation, it moves towards the sun, at first slowly, and afterwards with increased speed, in proportion as it approaches the sun, until it acquires, at its perihelion, a velocity almost inconceivable. But the repulsive force is at no time idle, and, as the body advances, the tail (or

atmosphere) elongates still more and more, until it reaches the perihelion, when the repulsive force again assumes the mastery and drives the comet forward. There being at all times a great preponderance of atmosphere, there is no danger of the comet falling to the sun, and yet there is sufficient matter in the body of the comet to prevent its altogether escaping from the influence of the sun's attraction. It is held in a tight grasp, though allowed almost unbounded latitude in its wanderings through space; like the kite that floats in the upper air at will, and in any direction, but must at length return to the hand of the boy who holds its string.

For what purpose comets were created, or what peculiar duties are assigned them in the Divine economy, we have yet to learn; but, as the Supreme Architect never does anything without an object of corresponding importance, we may rest assured that they have their ends to accomplish, and that we shall, sooner or later, be made familiar with their construction and purposes.

We may well believe, however, that one of these unusual visitants was made use of by the Almighty in accomplishing the destruction of the primitive earth by the deluge. Speculation on this awful subject may be deemed useless, but the human mind will receive and cling to (as it has the right to do) that speculation which is the most reasonable. The

one we advance is in perfect harmony with our whole system, and most especially with the Scripture records of that dread event.

A purely scientific writer, writing without any reference to this particular subject, has said that "if the earth were actually to receive a shock from one of these bodies, the consequences would be awful. A new direction would be given to its rotary motion, and it would revolve around a new axis. The seas, forsaking their beds, would be hurried, by their centrifugal force, to the new equatorial regions. Islands and continents, the abodes of men and animals, would be covered by the universal rush of the waters to the new equator, and every vestige of human industry and genius would be at once destroyed." Dr. Halley also confirms the opinion that such an occurrence "would instantly reduce the earth to chaos, *mingling its elements in ruin.*"*

We say, therefore, that it is not only possible, but highly probable that the Almighty used this natural means for the accomplishment of his fearful purpose, for we are unwilling to detract from the harmony

* We do not agree entirely with Dr. Brewster's idea of a new axis, &c., and merely quote him as good authority for the awfully destructive consequences which must ensue from such a collision. The Italicized portion of the quotation from Dr. Halley remarkably confirms our own ideas, and the language is singularly appropriate.

and perfection of His character, by supposing any special exercise of omnipotence necessary.

It will be remembered that we represented, in a former chapter, the solid earth as being a wall or partition between the waters above and under it, and gave it its appropriate name, viz., a *firmament* dividing the waters from the waters. Suppose now that, while the earth was making its revolution at the rate of one thousand miles an hour (a speed of which we can form no proper conception, for it is nearly seventeen miles a minute), a comet, driven from its track, should rush wildly through the intervening space, its tremendous velocity even enhanced by the earth's own attraction, and dash abruptly against our revolving sphere—what must be the inevitable consequence? One would imagine that both bodies must be crushed into atoms. Witness the terrific effects produced by the concussion of two steam-engines when under a speed of even ten miles an hour. And yet, it was merely necessary that the force of *this* concussion should break the comparatively thin crust of the earth, when the "waters under the earth," hitherto confined by the "firmament" surrounding them, would burst forth with their resistless torrents and speedily overwhelm the whole world. It was not even necessary that the body of the comet should touch the earth itself; the additional pressure of atmosphere induced by even

a moderate proximity of the atmosphere of the comet would doubtless be sufficient to accomplish this effect.

How beautifully and appositely does the language of Scripture come in to sustain this view of the subject. "The fountains of the great deep," *i. e.* the waters under the firmament were "*broken up.*" "*Broken up!*" The language is remarkable. The whole story is told in the simplest possible manner. There was an immense body of water somewhere, and something was *broken*, in order to give it a passage. Again, "the fountains of the deep were stopped." Simple and conclusive language again—just such language as we should use at the present day: something was first *broken*, and afterwards the hole or cavity was *stopped*. Precisely the same words are used by Job, David, and Solomon, in reference to the same subject. How much more reasonable our explanation of the Deluge is than other mere speculations, we leave to our readers to determine.

But, not even this presumption is necessary, and it savors too much of the miraculous, or, at least, of a deviation from the general laws of nature. It is an axiom that the Almighty acts by the simplest means, and, in this case, what may seem to have been the result of some special direction of Omnipotence, can be shown to have been the natural and

inevitable consequence of the laws of motion originally impressed upon the material universe. It cannot be necessary to stop and show that, if the rapid diurnal revolution of the earth was suddenly to cease, the most disastrous consequences would ensue. This very "breaking up," about which we have spoken, would be the inevitable result, for it is this motion of the earth on its axis that creates and preserves its rotundity, and the existence of a centre of gravity (otherwise impossible) is all that induces the cohesion of the particles that compose it. Now let the earth be revolving at the rate of seventeen miles a minute, and a large comet pass in the opposite direction, at the nearest possible point in their respective orbits, at a speed of over 20,000 miles per minute (as in the case of Halley's comet), what must be the result from the concussion of the atmosphere and the friction necessarily produced? Why, unquestionably, a tendency to stop the axial revolution of the earth, and, before the trembling sphere could have recovered from the shock, the disruption would have occurred. The minutest point of time, the thousandth part of a second would have sufficed to "break up" the thin crust that held in abeyance the concealed waters.

If it be urged that such a cause is not hinted at in any of the sacred writings, we answer that the catastrophe might have occurred in so short a space

of time, that even Noah, *shut up* in the ark as he was, and being the only survivor, knew nothing of the immediate cause. Or if, as we have intimated, only the atmosphere of the comet was brought into use, the body might still have been at a great distance from the earth. Suppose a comet, on the day of the deluge, to have been at a point in its orbit, distant from the earth only 240,000 miles, which is the mean distance of the moon from the earth. This is not a groundless supposition, for the comet of 1454 eclipsed the moon, and must consequently have passed between it and the earth. Suppose that, driven from its track, it approached the earth with the velocity attributed to Halley's comet, which is computed to be 1,240,108 miles per hour. It would have come in contact with the earth in less than twelve minutes! Add to this the additional velocity it would gain by being comparatively freed from the attraction of the sun, as well as that it would receive from the gravitation of the earth, and it would have come upon the inhabitants of the old world before they had time to think, or, to use the language of the Scriptures in reference to another event, "in a moment—in the twinkling of an eye." These are unanswerable facts, and the world of thought into which the subject would lead us is overwhelming.

To pursue it but a little farther at present (for it is our design to make it hereafter the theme of an

extended treatise), we will only say that by this great calamity, the original structure of the earth was entirely disarranged — its various elementary parts were thrown into utter confusion, and thus tremendous chemical revolutions throughout nature's vast laboratory produced all those terrible effects which are everywhere so apparent. Then were the mountains and valleys established, and *then took place the wonderful stratification of the earth, as we now find it.* The whole nature and character of the earth were changed: in the emphatic language of Scripture, "the world that then was *perished.*" We are assured that a similar calamity cannot again occur, for the present world, we are told, is "reserved unto fire."*

To conclude our present remarks upon comets, it is pertinent to say, that the gravitation of the sun,

* We would here call attention to the remarkable language of St. Peter in his Second Epistle, third chapter, fifth and sixth verses, viz.: "By the word of God the heavens were of old, and *the earth standing out of the water and in the water:* whereby the world that then was, being overflowed with water, perished."

The whole passage is worthy of the carefulest consideration, but the portion we have quoted is an admirable confirmation of our explanation of the "firmament" established on the second day of creation, as, indeed, of the accuraey of our whole system. Indeed, the original text is decidedly more emphatic: "ἐξ ὕδατος καὶ δι' ὕδατος συνεστῶσα," i. e. *consolidated from the water and through the water.*

as the centre of the system, being so great as to equalize that of all the other bodies composing the system combined, there is manifestly nothing to prevent them from falling to the sun, when at or near their perihelion, unless we suppose the existence of a repulsive power. "Centrifugal force" cannot account for their inability to reach the grand centre of attraction.

That comets may leave their original orbits is proved by the fact, already alluded to, of the disappearance of one among the satellites of Jupiter, and this is by no means an anomalous case; but, in order to relieve any anxiety that may arise in consequence of the possibility of such an occurrence, it may be well to state that the ablest mathematicians and astronomers of France, by direction of that government, not long since determined, *upon mathematical principles*, that of 281,000,000 of chances, there exists but *one* which can produce a collision between one of these bodies and the earth.

The singular appearance sometimes manifested by a comet (commonly called "shaking its tail") may be produced by the repulsive tendency of the atmosphere of that planet which it approaches too nearly, or by the sun's direct repulsion. As, during its rapid flight, it passes within the influence of various planetary bodies, oftentimes acting together and from va-

rious directions, it is not strange that a vibratory motion should be apparent in this ethereal appendage.

When a comet has no apparent head or nucleus, it indicates that the body has been dissolved, and that the elements remain in a volatile state, and regularly acted upon by the law of gravity.

Comets sometimes have two tails, one turned from and the other towards the sun. The former is the atmosphere of the body, which is invariably thus repelled, and the latter appearance is doubtless caused by a portion of the elementary parts being in a mixed or volatile state (perhaps the result of a conflagration), which portion would yield more readily to the attraction of the sun, and stretch out towards that body; or, this appearance may be the result of the repulsive force acting upon it from various directions, as alluded to in a preceding paragraph.

There is much yet to be learned respecting the composition and habits of these fantastic creations, but we unhesitatingly advance the assertion that what we *know* (with any degree of certainty) of their movements cannot be explained satisfactorily without the existence of, and a reference to, the law of repulsion.

One of the effects of our system is the establishment of the fact that the *density* of the planets is equal, whatever their relative distance from the centre of the solar system.

Two causes operate to produce this equality, viz.: The centre of gravity of the solar system, and the centre of gravity of each respective planet.

Solar attraction, acting upon the whole body of the planet, and tending to neutralize its inherent central attraction (possessed in common by every material body, and commonly called attraction of cohesion), has a tendency to separate the particles of matter of which it is composed, and, therefore, acts in opposition to that *planetary gravity* which binds external matter to a common centre. The centre of gravity of the solar system is the sun, from which body is derived the centripetal power which holds the planets in their orbits, or, in other words, which keeps them from flying off into the infinite regions of space, and to which every particle of matter in the solar system tends. Every planet is attracted by the sun in proportion to its distance from it and the quantity of matter it contains. *Central planetary attraction* is familiar to every mind. It is the power which preserves the globular appearance of the planets, and it acts upon the matter composing them in pro-

portion to its distance from their respective centres. It is entirely distinct from solar attraction, though somewhat affected by it.

The two powers are antagonistic in their operations and effects: while one increases, the other diminishes; and *vice versâ*. Solar attraction acts upward or outward from the centre of the planet, while planetary attraction acts downward or inward, from the surface to the centre. Solar attraction increases, and planetary attraction decreases as the body approaches the sun, and *vice versâ*, as the body recedes from it, thus preserving a sort of equilibrium, preventing the substance of the planet from being unduly compressed as it approaches to, or having its density diminished as it recedes from the centre of gravity of the solar system. Under such circumstances, the gravity of bodies on their surfaces must always remain equal. Suppose two planets of unequal dimensions, but composed of the same materials, to be at equal distances from the sun; the solar attraction experienced by the larger would be as much greater as the difference in the quantity of matter composing the two bodies, but the density of matter on their surfaces would remain equal, because in the same proportion that the larger one would be acted upon by solar attraction would its inherent attraction be lessened—while, in the case of the smaller planet, solar attraction being less, it would

retain more of its principle of cohesion, or central gravity.

The decrease of the density of planets, as their distances from the sun increase, is *not real*, but *apparent*. If Mercury were transplanted to a point in space as far from the sun as is Jupiter, the real density of the two planets (allowing for their difference in magnitude) would be the same, and for a very obvious reason. As the influence of solar attraction decreases, that of planetary attraction increases, and, therefore, at the distance of Jupiter from the sun, a planet rests more freely and independently on its own axis than one at the proximity of Mercury, which is, of course, held in a tighter grasp by the gravitating force of the sun. Were it not for this increased central attraction (combined with the repulsive principle of the atmosphere, which, it must be remembered, is ever in action), the rapidity of Jupiter's diurnal revolution (nearly twenty-six times greater than that of the earth) would cause matter to be ejected from its surface until there was nothing left of it. But, the separating influence of the sun's attraction being greatly decreased, planetary gravitation is correspondingly increased, and the planet itself acts proportionally independent; there is no disposition in the particles of matter composing it to fly off, but, on the contrary, to seek their immediate centre of gravity. We believe, therefore, that the

density of Mercury and Jupiter are equal, notwithstanding their immense difference of proximity to the sun.

On the same principles, and for the same reasons, we believe the *temperature* of all the planets to be equal. Each planet of our solar system took its position in space with an amount of atmosphere just sufficient to give to it its requisite quantity of light and heat, and to accomplish such other purposes as atmosphere was designed for. Atmosphere is as indestructible as the grosser forms of matter, and is subject, like them, to universal and unvarying laws. The atmosphere of a planet is neither added to nor diminished, nor changed in its nature. Its position as regards the body it envelops may be varied, and it may be regulated as to its depth or density; but its character, amount, and properties remain the same. There is just sufficient attached to each planet to enable the sun to operate upon it for the perfect well-being of the planet. As the planet approaches or recedes from the sun, the law of repulsion regulates the depth of its atmosphere, so that a uniform temperature is the result. Those planets most distant from the sun have a greater depth of atmosphere at their surface than those most near it, such being necessary in order to give them the same degree of heat; and this fact is proved by their greater independence of motion. Jupiter is

more self-sustaining than Mercury, possessing more of the elements of material existence, and being less dependent upon the sun. Mercury has less atmosphere, because, being nearer the sun, it requires less for the purposes of light and heat. There is no good reason for the old presumption that Mercury sustains a degree of light and heat seven times greater than that of the earth. On the contrary, reasoning from analogy, the laws of fitness and harmony, so apparent throughout the universe, would forbid it. There can be no necessity for it; and, as atmosphere is the undoubted medium of light and heat, without which we could neither see nor feel the effects of the sun's rays, and, as it is not likely there are different kinds of atmosphere, it is much more rational to suppose that the degree of heat on the surface of the various planets depends, not on their respective distances from the sun, but on the amount and depth, or disposition of their atmospheres, as regulated by the law of repulsion. It is, therefore, entirely probable that the inhabitants of the earth, so far as temperature is concerned, could exist with perfect ease in any of the planets composing the solar system.

We are not left entirely without proof of the position we advance. The eccentricity of the earth's orbit furnishes a positive demonstration. The earth, when in its aphelion, is 3,000,000 of miles more dis-

tant from the sun than when in its perihelion, and yet its density remains unchanged, though, to sustain the old theory of different density, there should at such times be a difference of about $\frac{1}{3}\frac{1}{2}$d in the weight of substances at its surface! And, as if to set the question of the heat of a planet depending on its distance from the sun forever at rest, it is an undeniable fact that the earth is 3,000,000 of miles nearer the sun in mid-*winter* than in mid-*summer!* From this proof alone, it is not unreasonable or irrational to deduce the propositions of *equal density* and *equality of temperature* throughout the solar system. The former mistake seems to have been caused by not remembering that, were we divested of the atmosphere surrounding us, the sun would be no more to us than a large ball of ice. The sun is not, we assert, the *source*, but the *dispenser* of light and heat, and it is merely by the combination of its rays with the elements of the atmosphere that we are made sensible of their existence and effects.

The difference between solar and central attraction, and their operations in producing equal density, may be familiarly illustrated by a reference to the formation of clouds. If vapor was acted upon only by the attraction of the earth, clouds could not be formed; but the inherent attraction of the particles themselves causes them to unite and tend to a common centre, and to increased density. As they in-

crease in size, the attraction of the earth becomes greater, and constantly renders nugatory their tendency to greater density, and thus they remain suspended in the upper regions of the atmosphere, as we witness them. The attraction which the particles of vapor have for each other illustrates the *inherent attraction of a planet*, and that exerted by the earth on the cloud the *solar attraction*.

The *separating* effect of solar attraction, of which we have spoken, is also beautifully illustrated by the falling of rain. As the clouds increase in size, the attraction of the earth is so augmented that their inherent attraction is overcome, and portions are drawn towards the earth, the particles of which, as they approach its surface, tend more and more to separate, until they are, at length, deposited in small drops of rain. Thus, while the attractive influence of one body serves to unite particles, that of another, acting upon the same particles, tends to separate them.

In our efforts to establish the existence of the law of repulsion, as a universal law of nature, we have necessarily alluded, directly or indirectly, to other subjects more or less pertinent, and expressed views and opinions at variance with those commonly received. Without being at all Quixotic, we profess to have attacked and vanquished sundry notions manifestly conceived in error, and which have been sustained so long only by that mental obstinacy which ever clings to "received opinions." Now, no axiom can be more certain than that "received opinions" are not correct simply because they are such, for they are often founded upon absolute fallacies. For a long time it was a "received opinion" that the earth's surface was a plane, and also that the sun revolved around the earth! A great and lamentable want of candor, and even of common honesty, is therefore evinced when minds (and oftentimes *great* minds) reject what claim to be new developments or discoveries in science or philosophy, simply because to receive them would require the abandonment of what they have previously learned, and what their fathers learned before them, and to which they are fatally wedded. It is this want of candor, this indisposition to investigate what purports to be original, simply because it is new, that we deprecate.

We only ask a careful and honest examination of the views we have set forth, feeling confident that that will be followed by their universal acceptation.

To the scientific world, we would say: we have given full credit to all who have gone before us, and received their discoveries and opinions with all due humility and reverence. But, while we war not with the Newtonian system, and firmly agree with its author on most points, we regard it as no presumption to say that that splendid scholar did not go far enough. From the effect produced on us, as we have advanced step by step in our investigations, we can well imagine not only the ecstasy but the positive fear and trembling with which his brilliant discovery was attended, and can easily see how he might have feared to push farther into the subject, lest his whole theory might be endangered. We live in a different age; when the lights of science burn more brightly, and the human mind is more capable of pursuing intricate and daring investigations. To you, we say, we have given, in the law of repulsion, a reasonable and consistent substitute for that force so long called centrifugal, the nature or cause of which, as well as its properties and operations, have ever been, by your own confessions, wholly unknown. Owing to this mystery, we have long groped in darkness, but (and reverently is it spoken) the Great First Author of all things has again said,

"Let there be light," and *there is light!* Still, we know there are those to whom our system will be distasteful, and who, only because it militates against their deep-seated notions, will look directly at this light and deny its existence. Such are like the "owlet" described by Coleridge, who

> "Sailing on obscene wings athwart the noon,
> Drops his blue-fringed lids, and holds them close,
> And hooting at the glorious sun in heaven,
> Cries out, 'Where is it?'"

For wilful blindness, as for wilful ignorance, we have no compassion. We cannot "strain" our "quality of mercy" sufficiently to give it nourishment. We claim to have proved what we attempted, and, therefore, while we court fair and honest investigation, we at the same time defy that kind of malice resulting from the disposition we have alluded to. We have traced, step by step, the progress of matter from its chaotic condition into the magnificent machinery of the wonderful universe. There is no defective point in our system; no forcing or straining of one of its parts to make it fit the rest; but the main law being assumed, one consequence follows another, and all unite together and sustain each other as harmoniously as the very spheres about which we have written. Our explanation of the nature and movements of comets is, in the same

degree, lucid and consistent; and those of equal density and equality of temperature open new and deeply interesting fields for future research. The consequences of these discoveries must be various and important. There are thousands of phenomena, of greater or lesser interest, which our system will explain, and which have heretofore been left, by the greatest minds, in avowed mystery. We will only allude to *the retardation of the planetary bodies* as one of the subjects rendered perfectly clear by our system, but which our present limited space prevented us from discussing. The principles involved in our system will be shown to extend from the universe, as a whole, to the smallest microscopic mite, and may be applied, not only to the movements of the spheres, but to the construction of machinery, the treatment of disease, and, in short, to every animal or physical purpose whatsoever. Indeed, the attainment of a perpetual motion is, by no means, a Utopian vision. It is not likely that we should make these strong assertions without knowing the ground we stand upon; and we therefore demand, as a right, as a positive duty you owe to science, that you give our system a careful, frank, and deliberate examination.

To the religious world, we would say: we have, while establishing our system by secular arguments, inevitably confirmed the grand pillars of your faith,

viz.: the existence of a Supreme Being, possessing all the attributes claimed for Him, and the exact and literal truth of that venerable record which you believe to have been written by His inspiration. Not that these facts needed confirmation, but the establishment of our system completely demolishes those "refuges of lies" which were the strongholds of the "scoffers" who were to "come in the last days." For this service, if for nothing more, we claim your attention and your testimony in behalf of the truth.

To every reader, we would say: we ask for only that to which we are entitled. Investigate, and then approve or condemn. Investigate, truthfully and honestly, and we have no fear of the result. We have no literary ambition to serve; no pecuniary ends to gain. Our sole objects and desires are—the advancement of science; the destruction of error; the establishment of truth; and, finally, the glory of God.

EXPLANATION OF THE FRONTISPIECE.

Fig. 1 represents the probable condition of the Earth on the second day of creation. See Genesis i. 6, 7.

Fig. 2 represents the results of the operations of the second day, viz., the accumulation of earthy matter at the equator, previous to its ejection.

Fig. 3 represents the probable position of the Seas, after "the gathering together of the waters," on the third day, into the cavities formed by the ejection of the superabundant matter at the equator.

Fig. 4 illustrates the position on pages 19 and 20, that the space beyond the limits of our atmosphere is not illuminated by the rays of the sun, but is in perfect darkness. Light radiates from the sun, and from the fixed stars, which are far beyond the convergence of the rays of the sun that strike the earth, in every direction and to interminable distances. If the whole immensity of space were illuminated by the rays of the sun, the comparatively minute shadow of the earth would not account for the darkness of night; else we should see the shadow of the earth stretching out like a dark cone, and terminating at a minute point in the heavens.

Fig. 5 shows the appearance of comets in their different positions in their orbits. When nearest the sun, the atmosphere (or tails) out of the orbit is elongated to the greatest extent, and that within the orbit is pressed nearest to the nucleus. When most distant from the sun, the extension is lost, and the atmosphere envelops the nucleus in almost a circle. At intervening distances, the length and breadth of the tail, both within and without the line of the orbit, are regulated with mathematical accuracy.